



Arctic National Wildlife Refuge

INTRODUCTION





Courtesy of U.S. Fish and Wildlife Service

Looking south to the Brooks Range.

The Arctic National Wildlife Refuge in the northeast corner of Alaska is one of the most pristine, undisturbed places on Earth. It covers 7,700,000 hectares (19 million acres). To the south is the rugged Brooks Range and to the north, the icy Arctic Ocean. The 600,000-hectare (1.5 million-acre) coastal plain is the most productive part of the refuge and the area used most by wildlife. This area is dominated by an ecosystem known as middle arctic [tundra](#). The treeless landscape is flat and covered with low-growing plants.

The Arctic National Wildlife Refuge is sometimes called America's Serengeti because of the number of animals that live here. Huge herds of [caribou](#), as well as [polar bears](#) and [musk ox](#), roam this vast plain. The Gwich'in Athabascan Indians have depended on these animal resources for over 12,000 years.

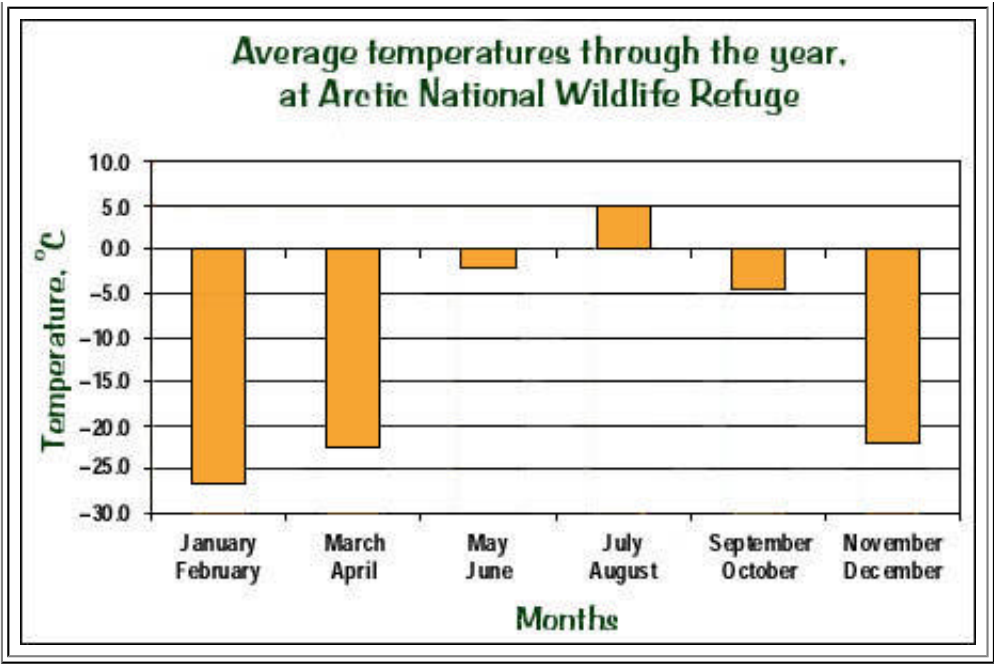
	
Courtesy of Jon Nickles, U.S. Fish and Wildlife Service	Courtesy of U.S. Fish and Wildlife Service
A caribou makes its way across the marshy arctic tundra.	The coastal plain of the Arctic National Wildlife Refuge is pitted with ponds during the short summer.

Two conservationists, National Park Service planner George Collins and biologist Lowell Sumner, recognized the unique nature of this ecosystem and began efforts to protect it in 1952. Federal protection started in 1960 with the establishment of the Arctic National Wildlife Range. In 1980, the U.S. Congress passed the Alaska Lands Act, renamed the area the Arctic National Wildlife Refuge, and doubled the size of the protected area. The refuge is the largest designated wilderness in the National Wildlife Refuge System. It is administered by the U.S. Fish and Wildlife Service in the Department of the Interior.

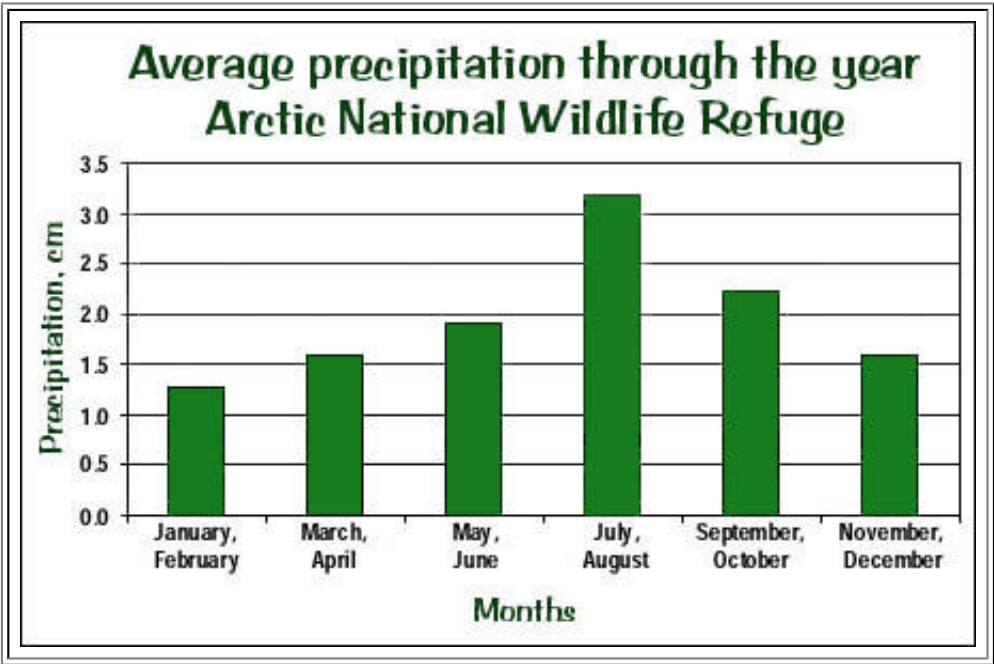
Congress created the refuge to protect the wildlife and habitats of this ecosystem for the benefit of people now and in the future. The Arctic National Wildlife Refuge and two parks in neighboring Canada have been proposed to form an international park. Many of the refuge's wildlife species are protected by international treaties.

ABIOTIC DATA

Frost, snowfall, and freezing conditions shape the tundra landscape in the Arctic National Wildlife Refuge. The extreme cold creates a layer of permanently frozen soil called permafrost. In May when the snow melts, the surface soil becomes waterlogged because water can't drain through the permafrost. The region becomes saturated with standing water and flowing streams.



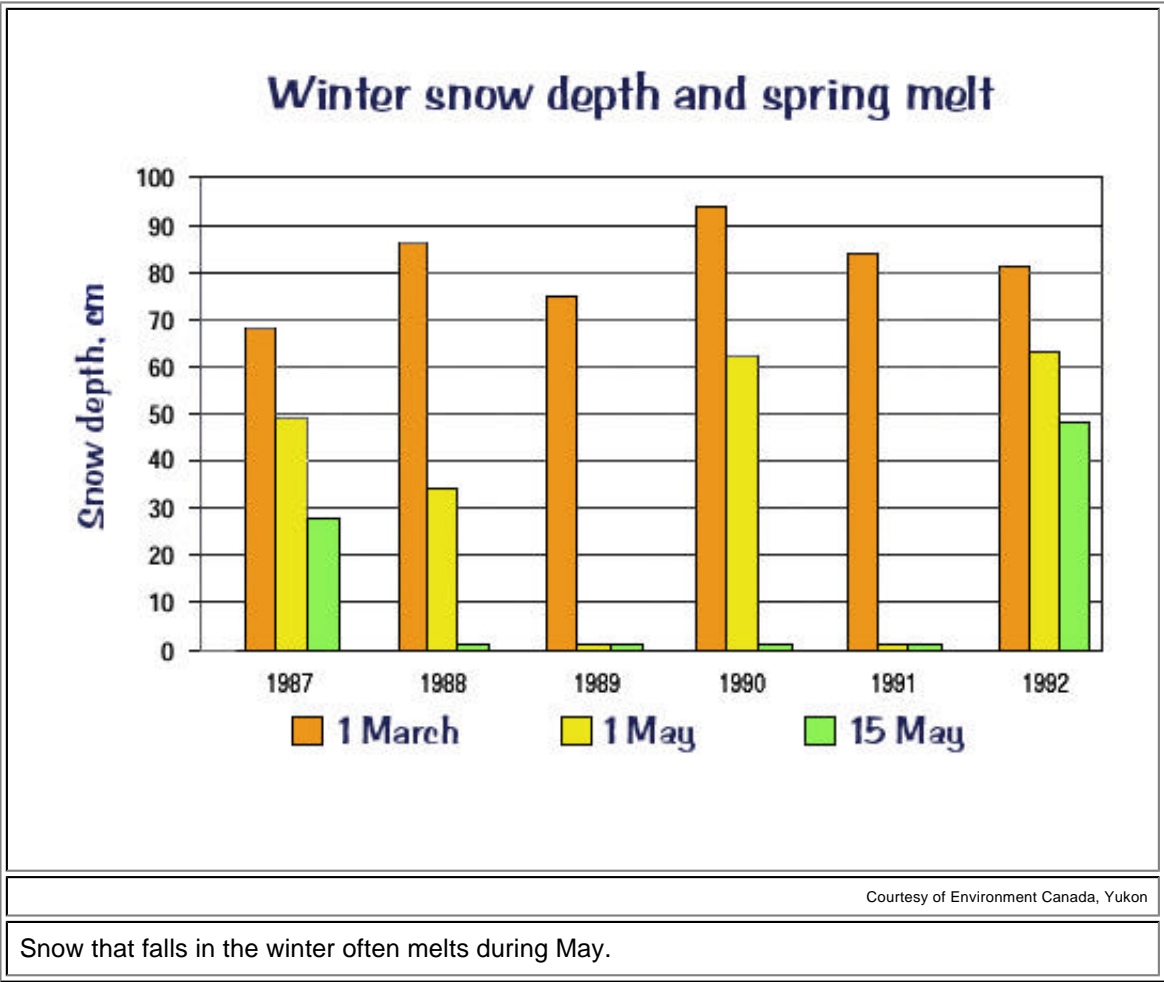
Because the Arctic National Wildlife Refuge is so far north, entirely above the Arctic Circle, the growing season is short, only 50–60 days. During summer the Sun never dips below the horizon, but its long, slanting rays do little to heat up the air. Temperatures range from 2 to 12°C (36 to 54°F). During winter the Sun never rises above the horizon. The noon sky looks like predawn. In winter, the temperature averages –34°C (–30°F).



There is little precipitation in winter or summer. Yearly precipitation, including snow, is only 15–25 centimeters (6–10 inches). Wind is a major factor in this area and can blow up to 160 kilometers per hour (100 miles per hour).



Snow can benefit plants and animals because of its insulating qualities. Snow shelters plants and animals from the strong winds and protects the ground from disturbance. Small mammals, such as [lemmings](#), make tunnels beneath the snow and avoid detection by predators.



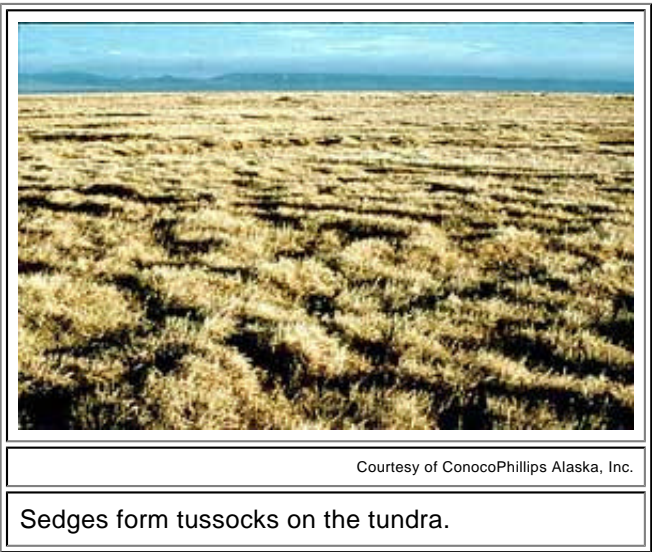
The ground has two layers, an active layer and a permafrost layer. The top active layer is made of dead and partially decayed plant material. It is very wet because the water cannot drain through the permafrost below. The active layer is not considered true soil, because the plant material decomposes too slowly. The depth of the active layer changes through the season from 0 to 45.5 centimeters (0 to 18 inches). Below the active layer is permafrost, made

up of gravel, frozen groundwater, and finer material. Permafrost never thaws.

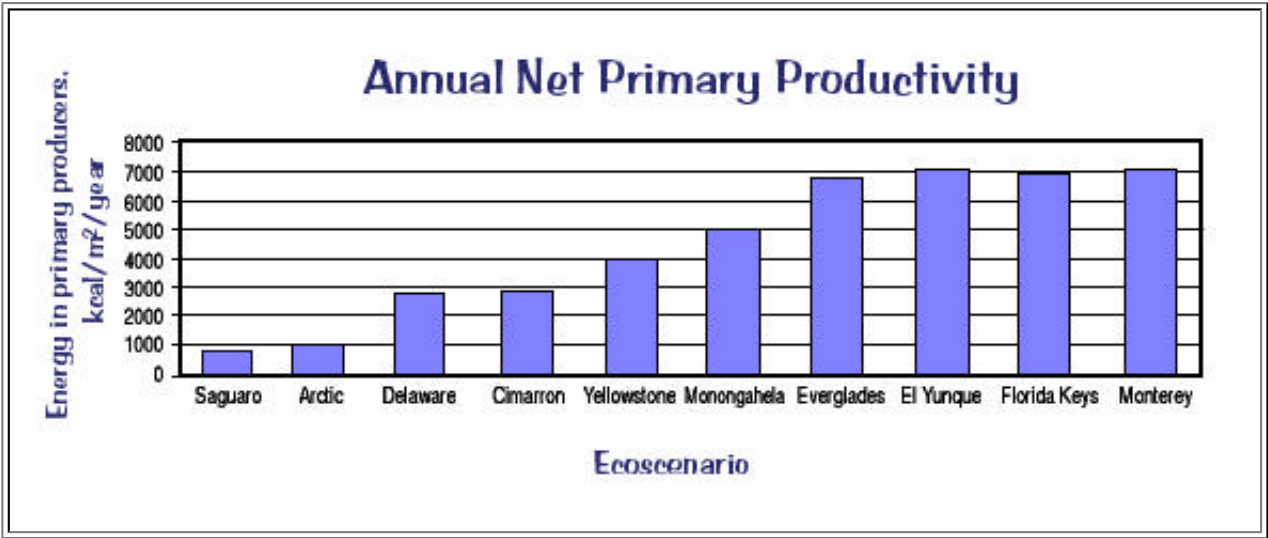
BIOTIC DATA

Biotic diversity in arctic tundra is generally low, food webs are simple, and populations usually have large fluctuations in size due to changing abiotic conditions. Plants and animals reproduce quickly in the short summer season.

Because of the permafrost, plants in the Arctic National Wildlife Refuge do not have deep roots. Only hardy plants that grow close to the ground can endure the effects of wind and cold temperatures. Grasses and [sedges](#) form in protective clumps called tussocks, and shrubs like [willow](#) and [Labrador tea](#) tend to be small species, under 1 meter (3 feet) tall. Because of the short growing season, many plants rely on asexual reproduction, such as cloning or budding, instead of flowering and forming seeds.

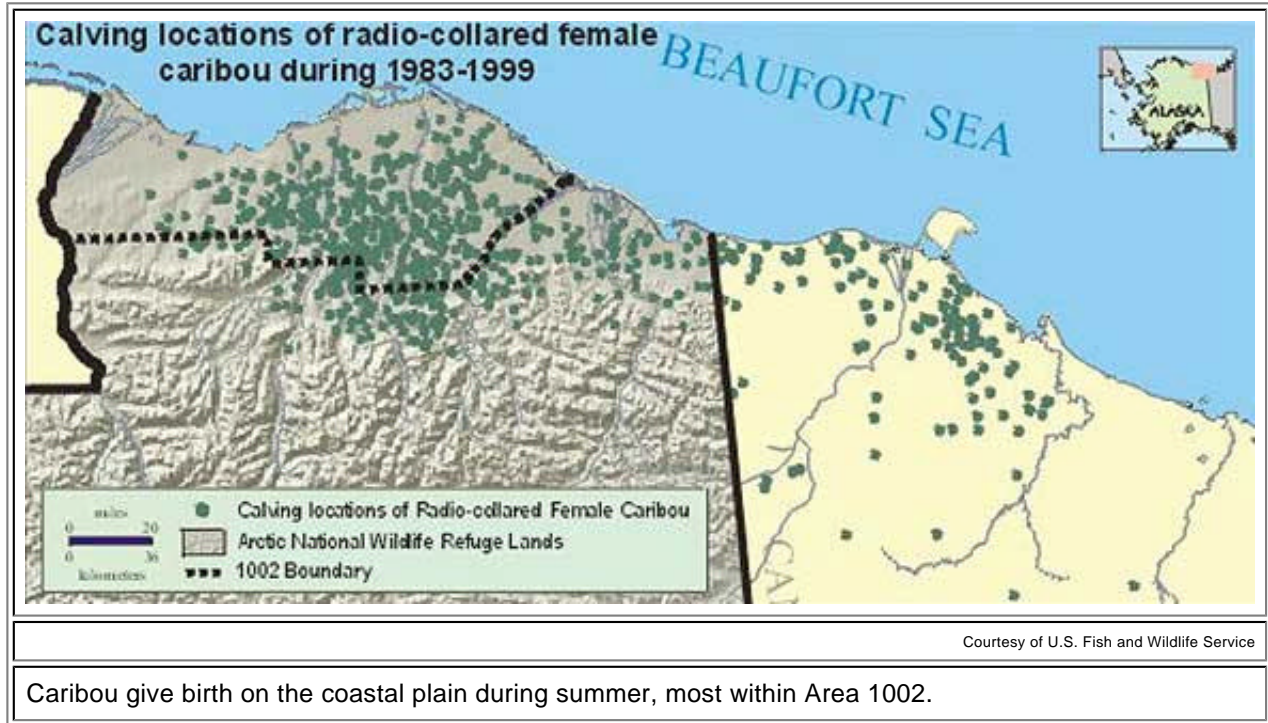


Annual productivity, or the amount of energy provided by the producers in this ecosystem, is low. High metabolic rates of some herbivores burn most of the calories that are provided by the producers. Because there is a limited amount of energy to go around, food webs are relatively simple.



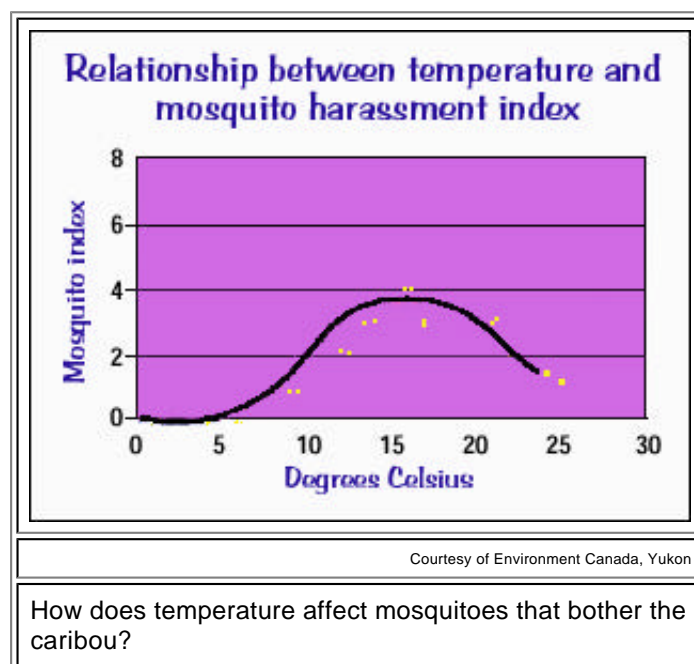
Important producers in the tundra are moss, [reindeer lichen](#), [cotton grass](#), [sedges](#), and [willows](#). Tundra plants are adapted to grow in this harsh environment. Plants are low and tough, and leaves are small with a thick epidermis to

slow transpiration. Vegetation is dark green to red. This allows plants to absorb more of the limited solar radiation.



[Reindeer lichen](#) is two different organisms living together in a symbiotic relationship. A photosynthetic alga lives inside a protective, structural fungus. This lichen has a treelike form and forms hummocks on the soil. Lichen serves as the major food of the caribou, especially during the winter. [Caribou](#) use a front antler tine and hooves to scrape snow cover away from lichen.

[Musk ox](#), [polar bears](#), and [caribou](#) roam the coastal plain. They breed there in the summer where there is abundant, nutritious food and few predators. Standing water on the summer tundra is an excellent breeding ground for [mosquitoes](#) and [black flies](#). Swarms of these insects are attracted to caribou herds and are such a nuisance that the caribou find it difficult to feed. Coastal breezes provide the caribou with some relief from mosquitoes and black flies.



Other animals found on the tundra include [arctic foxes](#), [snowshoe hares](#), [lemmings](#), snow geese, and [snowy owls](#). Many species of migratory birds nest on the marshy tundra during the short summer, leaving in fall to spend winter in warmer areas.

Animals living on the tundra have adaptations to keep them warm. [Weasels](#), rabbits, hares, and [musk ox](#) have two layers of hair, a soft, short layer close to the skin and a coarser, longer layer of guard hairs. Both layers work to keep warm air near the body and cold air and snow away. Some animals also have small ears, short legs, and short tails, which help reduce heat loss.

[Caribou](#) have long, dense winter coats with hollow hairs for effective insulation. Both males and females have antlers, which are covered with velvet and fed by many blood vessels as they grow. Large concave hooves help caribou paw through the snow to reach buried lichens. Their broad hooves act like snowshoes and help them cross snow in winter and walk through soft, boggy pools in summer.



Courtesy of U.S. Fish and Wildlife Service

The huge Porcupine Herd migrating across the tundra of the Arctic National Wildlife Refuge.

Caribou migrate in huge herds from their wintering grounds in the Brooks Range [taiga](#) to calving grounds on the coastal plain over 640 kilometers (400 miles) away. They return yearly to the same calving grounds because there are few predators and high-quality food is abundant. Calving occurs during a 10 days in late May to early June. At this time, cows and calves are most vulnerable to predators and sensitive to any disturbances.

[Musk ox](#) have roamed in the arctic since the Ice Age. They are well adapted for living on the tundra. To keep warm, they have a long, shaggy coat of guard hairs with shorter underfur that is extremely soft and fine. It can protect the musk ox in temperatures as low as -73°C (-100°F). The underfur, or wool (called qiviut), is shed in summer and collected by Alaskan natives to make woolen clothing.

Musk ox travel in herds of 20–30 animals. When attacked by [wolves](#), the larger adults form a circle with their horns facing outward. Young musk ox are protected in the middle of this circle. Extremely efficient at processing food, they need only one-sixth the food a similar-sized cow would use. In seasons when food is especially poor, they may wander into the wolves' range in search of food.

	
Courtesy of U.S. Fish and Wildlife Service	Courtesy of U.S. Fish and Wildlife Service
Musk ox huddle together for protection from predators and cold weather.	Snow geese and other migratory birds nest in the Arctic National Wildlife Refuge during the short summer.

Small rodents, like [snowshoe hares](#) and [lemmings](#), are common on the tundra. Their populations are closely linked to their food supply and predator population. During summers when food is abundant, litters are larger and the populations grow. Larger populations of rodents support larger populations of predators, such as [lynx](#) and [snowy owls](#).


Many animals on the tundra have two color phases, one for summer and one for winter. Snowshoe hares and [arctic foxes](#) have heavier winter fur that is white and helps to camouflage them in snow. This fur is shed in summer to reveal darker fur. Some birds that remain in the arctic year-round, such as the [willow ptarmigan](#), have white plumage in winter and darker plumage in summer.

[Wolves](#), foxes, and [weasels](#) are predators found on the tundra. A wolf pack will kill 11–14 caribou annually, usually during migration or in winter. Wolves will also attack musk ox, but they live out of the wolves' range most of the year. Arctic foxes are well adapted to live in the cold and do not need to hibernate in winter. They hunt small rodents and feed on abandoned kills of other predators.

[Polar bears](#) are found in the Arctic National Wildlife Refuge, but spend most of their life on the ice flows in the Arctic Ocean. They feed primarily on seals, but will also eat fish, seaweed, grass, birds, and occasionally caribou. They return to the coastal plain in winter to hibernate. They spend so much of their life in the water and on the ice that they are considered to be marine mammals, like sea otters. They have thick, white fur that protects them from the icy water and camouflages them on snow and in the water. Wide paws and coarse fur on the soles of their feet give them traction on ice.



ISSUES

A long-standing issue in the Arctic National Wildlife Refuge is whether the coastal plain should be developed for oil drilling. Other areas in Alaska, such as Prudhoe Bay, have already experienced oil drilling. Petroleum scientists have examined part of the refuge, called Area 1002, and predict that oil is there. When the U.S. Congress established the Arctic National Wildlife Range in 1960, they made provisions to authorize future oil development in the northern part. People have been debating the issue of oil and gas drilling in Area 1002 for almost 40 years.


Courtesy of U.S. Fish and Wildlife Service
A developed oil field might look like this one in Prudhoe Bay, Alaska.

The process of drilling for oil

Oil, like other fossil fuels, comes from decayed and pressurized plant material that has been buried and partially fossilized. Deep beneath the surface and permafrost, oil moves through rocks with microscopic holes (porous rock) until it comes in contact with nonporous rock. It collects at the contact of these two types of rock. The first step in drilling for oil is determining if a location has the kinds of rocks that are associated with oil deposits. Scientists can tell about buried rock by drilling cores of the rock or by tracing sound waves as they travel through different rock types (seismic surveying). Next, oil wells are built, tapping into the deposit. The high pressures underground force the oil up the well, where it can be collected. A pipeline transports this crude oil to a refinery. Here the crude oil is refined to oil that can be used to generate electricity or lubricate machines. In the arctic, oil development in isolated areas involves building roads, drilling platforms, pipelines, refineries, and housing facilities for workers.

	 <p>June 1999, 15 years after disturbance</p>
Courtesy of U.S. Fish and Wildlife Service	Courtesy of U.S. Fish and Wildlife Service
During seismic exploration activities in March 1985, vehicles compacted the snow and damaged underlying plants.	Fifteen years later, scars from the seismic exploration activities can still be seen.

THE DEBATE

Before making decisions that affect an ecosystem, it is important to gather information from a variety of sources. Below are the views of several individuals or groups that have an interest in the future of the Arctic National Wildlife Refuge. After each quote the hyperlink goes to the original source of the quote. Refer to these sites for more information.

Use the information provided to decide where you stand on this debate.

DEBATE: Should oil drilling be allowed in the Arctic National Wildlife Refuge?

People who support drilling in the Arctic National Wildlife Refuge

Benjamin P. Nageak of the Inupiat people and former mayor of North Slope Borough, Alaska, on Arctic National Wildlife Refuge development

"I fully understand the fears of many people that the presence of the oil industry on the coastal plains will disrupt the wildlife. They fear that industry activity will destroy a part of this earth that should be preserved.

In 1969, when oil was first discovered on our lands, those fears were foremost in our minds as we fought for self-determination in order to be able to protect our resources. Since then, we have had over twenty years of working with the oil industry here. We enacted strict regulations to protect our land and the oil companies have consistently met the standards we imposed.

"ANWR holds resources that can be extracted safely with care and concern for the entire ecosystem it encompasses. The Inupiat people, working through the North Slope Borough, will act in the same careful, caring and cautious manner we always have when dealing with our lands and the seas."

<http://www.anwr.org/people/nageak.html>

R. Dobie Langenkamp, National Energy-Environment Law and Policy Institute (NELPI), University of Tulsa, Oklahoma

"30 years of experience in the existing North Slope oil fields, 80 miles west of ANWR, show no detrimental effects on caribou. In fact the Central Arctic caribou herd, which uses that area, has tripled in size since oil development began in the early 1970's."

<http://www.anwr.org/anwrtest/FP98/caribou.htm>

Mortimer B. Zuckerman, editor in chief, U.S. News & World Report

"Here are some of the new developments: Directional or slant drilling makes it possible to drill numerous wells from a single small production pad, resulting in a footprint so small as to have virtually no impact on wildlife. Even if enormous reserves were discovered, only a fraction of the 1.5 million acres would be affected. There's more. During winter, when no caribou are present, ice roads, ice airstrips, and ice platforms would replace gravel, so that in spring, when the ice melts, the drilling during the harsh winter would have left virtually no footprint."

<http://www.anwr.org/features/conundrum.htm>

Lon Sonsalla, mayor, City of Kaktovik, Alaska, the only community located within the coastal plain of the Arctic National Wildlife Refuge

"The most important thing is the future for the people out here. Declining revenues in the North Slope Borough have affected everybody who lives here. We're looking forward to the future and we are not sure what the future would be like without ANWR."

<http://www.anwr.org/features/whotocall.htm>

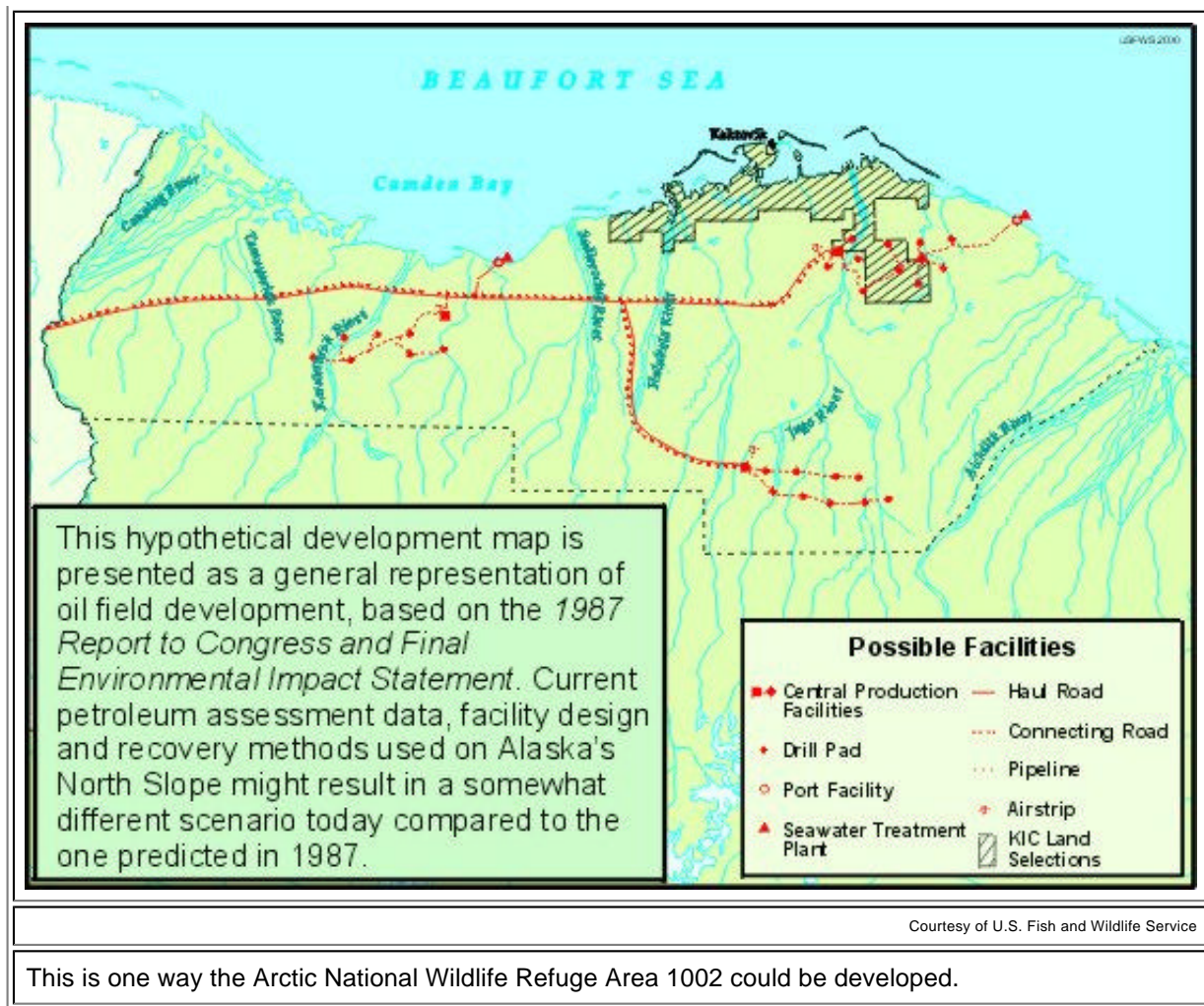
Survey results of residents of Kaktovik, Alaska

78% of residents surveyed thought the coastal plain of the Arctic National Wildlife Refuge should be open to oil and gas exploration.

75% were satisfied with the environmental practices of the oil industry on the North Slope.

71% felt the quality of life in Kaktovik will diminish if oil development ceases.

http://www.kaktovik.com/anwr_survey.htm



People who oppose drilling in the Arctic National Wildlife Refuge

Roger Kaye (wilderness specialist/pilot) and Jim Kurth (Arctic National Wildlife Refuge manager, 1995 to 2000), 6th World Wilderness Congress, Bangalore, India, October 1998

"Lowell Sumner compared the Refuge to a national monument most Americans will never see. But by just knowing it is there, they have a tangible entity to which they can attach national values they hold dear and believe should be enduring. The Arctic Refuge serves a similar function for natural values...So we stand committed to the promise—the promise made by the past generation to all future generations—that this remnant landscape will be passed on undiminished, that its values will endure."

<http://alaska.fws.gov/nwr/arctic/indiacon.html>

Faith Gemmill of the Gwich'in Indian Nation

"The birthplace of the Porcupine River Caribou Herd is considered Sacred. In 1988, when we heard of the proposed oil development, we gathered for the first time in over a hundred years in Arctic Village. Everyone spoke resolutely about how important the caribou are to our culture. At the end of the gathering, we spoke with one voice, one mind and one heart with a renewed commitment to protect our way of life for future generations."

<http://www.alaska.net/~gwichin/background.html>

Member of the Gwich'in community

"The oil companies say there is over 27 billion barrels of oil under Area 1002, but only a small portion of that can actually be recovered."

USGS report, Arctic National Wildlife Refuge, 1002 Area, Petroleum Assessment, 1998, Including Economic Analysis

"Recoverable oil within the ANWR 1002 area is estimated to be between 4.3 and 11.8 billion barrels, with a mean value of 7.7 billion barrels."

<http://geology.cr.usgs.gov/pub/fact-sheets/fs-0028-01/fs-0028-01.htm>

Norma Kassi, Gwich'in activist and Caribou Commons Project speaker

"The relationship between the Gwich'in and the caribou is not one of convenience; it is one of necessity. A healthy Porcupine Caribou Herd is necessary for the continued survival of Gwich'in culture."

<http://www.cariboucommons.com/issue/issue.html>

Tanana Chiefs Conference, Inc., board of directors, Resolution No. 90-2, March 1990

"Protect Porcupine Herd—Its Ecosystem and the Gwich'in Way of Life

"NOW THEREFORE BE IT RESOLVED: That the Tanana Chiefs Conference Board of Directors urges the U.S. Congress and President to recognize the rights of our Gwich'in people to continue to live their way of life by prohibiting development in the calving and post-calving grounds of the Porcupine Caribou Herd; and

"BE IT FURTHER RESOLVED: That the 1002 area of the Arctic National Wildlife Refuge be made Wilderness to achieve this end."

<http://arcticcircle.uconn.edu/ANWR/tanana.html>

What has happened in this debate?

In 1980 President Jimmy Carter signed the Alaska National Interest Lands Conservation Act. This act expanded the refuge to its present size of 7,700,000 hectares (19 million acres). The Alaska Lands Acts left Area 1002 open for possible oil development upon the approval of Congress.

The United States and Canada agreed in 1987 that they both have the responsibility of overseeing Porcupine Caribou Herd habitat within the Arctic National Wildlife Refuge.

A 1996 congressional study was conducted to assess the oil and gas potential of Area 1002. At that time it was concluded that the low price for oil did not make it profitable to open up the Arctic National Wildlife Refuge for drilling. The debate was reopened in 2001 after oil prices had risen and drilling in the refuge would be profitable. Government officials disagree about oil drilling in the Arctic National Wildlife Refuge. They could decide either to make it a permanent reserve or to open it for drilling.

The debate continues as Congress prepares to act on this issue. As the time draws near for Congress to act, supporters for both sides of the issue work to sway public opinion.

Questions

- Which side of this debate do you support?
- What scientific evidence supports your position?
- After looking at the evidence, did you change your position? Please explain why.

WEB LINKS

U.S. Fish and Wildlife Official Arctic National Wildlife Refuge - <http://www.r7.fws.gov/nwr/arctic/arctic.html>

Arctic National Wildlife Refuge - <http://www.anwr.org/>

Arctic National Wildlife Refuge: A Special Report - <http://arcticcircle.uconn.edu/ANWR/>

Benjamin P. Nageak of the Inupiat people and former mayor of North Slope Borough, Alaska, on Arctic National Wildlife development - <http://www.anwr.org/people/nageak.html>

City of Kaktovik, Alaska, ANWR Survey - http://www.kaktovik.com/anwr_survey.htm

Congressional Research Service, CRS Issue Brief for Congress: *The Arctic National Wildlife Refuge*, September 1996 - <http://cnie.org/NLE/CRSreports/Biodiversity/biodv-14.cfm>

Congressional Research Service, CRS Issue Brief for Congress: *The Arctic National Wildlife Refuge: The Next Chapter*, August 2001 - <http://cnie.org/NLE/CRSreports/Natural/nrgen-23.cfm>

Faith Gemmill of the Gwich'in Indian Nation - <http://www.alaska.net/~gwichin/background.html>

George N. Ahamaogk, North Slope Borough mayor - <http://www.anwr.org/features/ahmaogak-speech.htm>

Gwich'in Steering Committee - <http://www.alaska.net/~gwichin/index.html>

Lon Sonsalla, mayor, City of Kaktovik, Alaska - <http://www.anwr.org/features/whotocall.htm>

Michael Grunwald, Washington Post staff writer, *Some Facts Clear in the War of Spin over Arctic Refuge*, Wednesday, March 6, 2002 - <http://www.washingtonpost.com/ac2/wp-dyn/A44300-2002Mar5?language=printer>

Mortimer B. Zuckerman, editor in chief, *U.S. News & World Report* - <http://www.anwr.org/features/conundrum.htm>

Norma Kassi, Gwich'in activist and Caribou Commons Project speaker - <http://www.cariboucommons.com/issue/issue.html>

Northern Alaska Environmental Center, *Alaska's Arctic* - <http://northern.org/artman/publish/arctic.shtml>

R. Dobie Langenkamp, National Energy-Environment Law and Policy Institute (NELPI), University of Tulsa, Oklahoma - <http://www.anwr.org/anwrtest/FP98/caribou.htm>

Roger Kaye and Jim Kurth, *The Arctic National Wildlife Refuge: The Evolving Meaning of a Symbolic Landscape* - <http://alaska.fws.gov/nwr/arctic/indiacon.html>

Taiga Net, Porcupine Caribou Herd - <http://www.taiga.net/caribou/pch/>

Tanana Chiefs Conference, Inc., board of directors, Resolution No. 90-2, March 1990 - <http://arcticcircle.uconn.edu/ANWR/tanana.html>

U.S. Fish and Wildlife Service, news release, *Secretary Babbitt on USGS Assessment of Oil Reserves under Arctic National Wildlife Refuge*, May 1998 - <http://darwin.eeb.uconn.edu/Documents/fws-980517.html>

U.S. Fish and Wildlife Service, news release, *Secretary of the Interior Bruce Babbitt on New Legislation by Senator Frank Murkowski to Permit Oil Exploration in the Arctic National Wildlife Refuge*, March 2000 - <http://news.fws.gov/NewsReleases/R9/A11C3D39-AC20-11D4-A179009027B6B5D3.html>

USGS report, *Arctic National Wildlife Refuge, 1002 Area, Petroleum Assessment, 1998, Including Economic Analysis* - <http://geology.cr.usgs.gov/pub/fact-sheets/fs-0028-01/fs-0028-01.htm>
